

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)	
)	
Amendment of Parts 0, 1, 2, 15 and 18 of the Commission's Rules Regarding Authorization of Radiofrequency Equipment)))))	ET Docket No. 15-170
Request for the Allowance of Optional Electronic Labeling for Wireless Devices))	RM-11673

To: The Commission

**COMMENTS OF ARRL,
THE NATIONAL ASSOCIATION FOR AMATEUR RADIO**

ARRL, the national association for Amateur Radio, formally known as the American Radio Relay League, Incorporated (ARRL), by counsel and pursuant to Section 1.415 of the Commission's Rules (47 C.F.R. §1.415), hereby respectfully submits its comments in response to the *Notice of Proposed Rule Making*, FCC 15-92, released July 21, 2015 (the Notice)¹ which proposes to update the rules that govern the evaluation, approval and marketing of RF devices.² For its comments in response to the proposals and issues raised in the Notice, ARRL states as follows:

I. Introduction and Background.

1. In this proceeding, the Commission proposes changes to its equipment authorization processes (Part 2 of the Commission's Rules) in several respects. The Notice proposals pertain in part to labeling of Part 15 and Part 18 devices and the rules governing those categories of equipment. There are also proposals to modify the Commission's rules so as to further preclude

¹ Amendment of Parts 0, 1, 2, 15 and 18 of the Commission's Rules Regarding Authorization of Radiofrequency Equipment, *Notice of Proposed Rulemaking*, 30 FCC Rcd 7725 (2015).

² On August 25, 2015 the Chief, Office of Engineering and Technology released an Order (DA-15-956) in this proceeding granting the motions of several parties and extended the comment and reply comment dates to and including October 9, 2015 and November 9, 2015 respectively. Therefore, these comments are timely filed.

unauthorized tampering with network devices with RF components. There are rules discussed in this proceeding which are intended to prevent modifications to firmware, including modification of Wi-Fi network equipment by other than the equipment authorization grantee. For example, manufacturers of devices operating in the 5 GHz U-NII spectrum may be called upon to implement security features to ensure that the network devices cannot be modified. Such requirements, to the extent that they would, individually or in the aggregate have the effect of precluding the adaptation of network equipment for Amateur Radio use in Amateur Radio allocations by licensed Amateur Radio operators, are problematic. The Amateur Radio Service has a very long tradition of modification and adaptation of commercial communications equipment. This process results in multiple benefits: (1) contributions to the advancement of technical research and development with respect to that commercial equipment and next generations of that equipment; and (2) facilitating the development of sophisticated, state-of-the-art Amateur Radio communications systems which promote technical self-training of licensees and the other purposes expected of the Service by the Commission (*See*, 47 C.F.R. §97.1).

2. The Notice proposes to update the rules that govern the evaluation and approval of radiofrequency (RF) devices. Specifically, the Commission proposes to:

- Combine the Declaration of Conformity (DoC) and Verification equipment authorization procedures into a single self-approval program;
- Codify and clarify the provisions for certification of modular transmitters and radios where the RF parameters are controlled by software;
- Clarify responsibilities for compliance when a final product may be composed of one or more certified modular transmitters;
- Codify existing practices protecting confidential and market-sensitive information;
- Codify and expand existing guidance for electronic labeling; and

- Discontinue the filing of FCC Form 740 for RF devices imported into the United States.

ARRL herein offers comment on several of these proposals and in addition offers some additional suggestions for equipment labeling relative to certain Part 15 and Part 18 devices which should contribute to interference avoidance and misapplication of that equipment.

II. Equipment Self-Approval.

3. The Commission's proposal to create a new self-approval program for equipment authorization is, in ARRL's view, not well-taken, because it facilitates abuse by unscrupulous importers and manufacturers of unintentional emitters. The Notice proposes to do away with the DoC authorization program by combining it with equipment verification to form a "Suppliers Declaration of Conformity" (SDoC) category of equipment authorization. Testing of unintentional RF radiators subject to the SDoC will not require testing in an accredited laboratory; it will not require database registration; and it will not require any review by an independent third party. The FCC logo would also be abandoned, but certain compliance-related information would have to be provided with the product at time of marketing. The combination of self-certification and the elimination of the obligation to utilize an accredited laboratory encourages and facilitates the introduction into the United States marketplace of non-compliant unintentional emitters and offers no oversight. The Commission is not now and never has been equipped to conduct post-point-of-sale enforcement with respect to any RF devices, intentional or unintentional emitters, and so the only opportunity to preclude widespread sale and deployment of non-compliant RF devices, including unintentional emitters, is via the equipment authorization process. Amateur Radio operators and AM broadcast licensees, to name just two victims of interference from unintentional emitters (such as RF lighting ballasts) that routinely exceed the Commission's conducted emission limits, are adversely affected throughout entire

communities by these devices. The solution is not to loosen, but to tighten the procedural controls over the testing and affirmative confirmations of compliance by manufacturers, so as to ensure a greater level of compliance in conducted emission limits and other technical parameters that determine contributions of these devices to ambient noise levels.

4. Furthermore, the current DoC process works very well to control electromagnetic interference (EMI) and noise from certain unintentional emitters. In ARRL's experience with EMI problems impacting Amateur Radio, there have been very few reports of harmful interference from devices that were authorized under a DoC. ARRL has, however, received and investigated numerous reports of interference from devices that are required to be verified under the rules. A number of interfering devices, when tested by the ARRL Laboratory, have been found to exceed the FCC limits, sometimes by an alarming amount. The one significant difference between Verification and the present DoC is that to authorize a product under a DoC, a manufacturer must have it tested by a laboratory approved by the Commission. It is clear in practice that unapproved labs, or self-testing, that are used by many manufacturers in the Verification procedure do not control EMI as well as testing done by competent laboratories. In ARRL's view, the solution to the EMI problems that have come from Verification is to increase the level of performance of testing used for Verification.³ One way to do this would be to have the rules require that all laboratories used for any form of authorization testing comply with the

³ In some cases, RF devices now subject to the Verification process should be recategorized and made subject to the Certification process. RF "grow lights" for example, and all lighting controllers that operate at power levels of greater than 400 watts should be authorized under the Certification process, due to the very substantial interference potential of the devices. These are now subject to the much more informal Verification process that is clearly not working well. Given the number of interference complaints, the overwhelmingly large number of instances of non-compliance with conducted emission limits, and the extreme difficulty in any post-point-of-sale enforcement related to these devices, a review of the equipment authorization rules applicable to these devices in particular is amply justified.

C63 series of EMC standards and that they hold current accreditation with a recognized laboratory accreditation body.

III. Software-Defined Radios.

5. With respect to Certification of software-controlled radios (SDRs), the Notice for the most part continues the policies that have been in place for some time. However, the proposed new rules would require a grantee of an SDR to (a) explicitly describe the RF device's capabilities for software configuration and upgradeability including all frequency bands, power levels, modulation types, or other modes of operation for which the device is designed to operate, including modes not enabled in the device as initially marketed; and (b) specify which parties will be authorized to make software changes (*e.g.*, only the grantee, the wireless service provider, or other authorized parties) and the software controls that are provided to prevent unauthorized parties from enabling different modes of operation. This information would be included as part of the operational description information required in the application for certification. It is not clear how this would affect Amateur Radio SDRs, which are not now subject to grants of Certification. However, the Notice, at paragraph 46, states as follows:

Our proposed rules would require that *all* manufacturers of devices that have software-based control of RF parameters must provide specific information about the software capabilities of their devices. The proposed rules would also make it easier for manufacturers to implement software changes, either under the initial grant of certification or through subsequent changes. We propose to require that an applicant for certification must explicitly describe the RF device's capabilities for software configuration and upgradeability in the application for certification. This description would include all frequency bands, power levels, modulation types, or other modes of operation for which the device is designed to operate, including modes not enabled in the device as initially marketed. Currently our rules require such a description only for devices approved under SDR rules or for devices operating in specific bands.

6. This would seem to indicate that all SDR manufacturers, including those who market and sell their products only to the Amateur Radio community would be subject to these new

requirements. Now, Section 2.1060 of the Commission's rules (which pertains to equipment authorization obligations relative to Amateur Radio equipment) does *not* incorporate the requirements of Section 2.944 pertaining to SDRs. Indeed, in Docket 03-108, the Commission carefully did not subject Amateur Radio SDR equipment to the rules governing use of SDRs in other radio services. In a Report and Order in the Cognitive Radio proceeding released March 11, 2005, at paragraph 62,⁴ the Commission specifically declined to impose any restrictions on Amateur SDRs, including firmware requirements:

In the *Notice*, we proposed to exempt manufactured software defined radios that are designed to operate solely in amateur bands from any mandatory declaration and certification requirements, provided the equipment incorporates features in hardware to prevent operation outside of amateur bands. We also sought comment on the need to restrict the mass marketing of high-speed digital-to-analog (D/A) converters that could be diverted for use as radio transmitters. ARRL and the National Public Safety Telecommunications Council state that it is not practical to incorporate features in the hardware of an amateur transceiver to prevent transmissions outside of amateur bands. Intel, ITI, Cisco, Raytheon, ARRL and the Electronic Frontier Foundation oppose regulating the marketing of high speed D/A converters, generally stating that such a requirement would be burdensome, increase costs to consumers and not necessary because these devices do not pose a risk of interference. No parties have provided any information that shows that software programmable amateur transceivers or high-speed D/A converters present any significantly greater risk of interference to authorized radio services than hardware radios. Therefore, we decline to adopt any new regulations for amateur transceivers or D/A converters at this time. However, we note that certain unauthorized modifications of amateur transmitters are unlawful, and may revisit both of these issues in the future if misuse of such devices results in significant interference to authorized spectrum users.

7. The Commission thus exempted Amateur Radio equipment across the board from SDR limitations. There were in that same 2005 Report and Order separate provisions that required that software for SDRs be submitted to the Commission for review in the equipment authorization process. Those provisions did not specifically exempt Amateur Radio equipment, but in practice,

⁴ See, the Report and Order, *Facilitating Opportunities for Flexible, Efficient, and Reliable Spectrum Use Employing Cognitive Radio Technologies*, 20 FCC Rcd 5486 at 5508 (2005).

the above-cited exemption was viewed as superseding the more general requirement that software (in general) be submitted to and reviewed by the Commission. That interpretation has survived to the present time. Similarly, therefore, ARRL would urge that the Commission continue to take the position that the proposed rule changes governing SDRs in the instant proceeding generally, if adopted, have no application to Amateur Radio SDR equipment. It is notable in this context that in the intervening ten years since the Commission adopted its exemption of Amateur Radio SDRs there have, to ARRL's knowledge, been no instances of unauthorized modification of Amateur SDR transmitters or misuse of such devices.

IV. Equipment Labeling.

8. The Notice proposes a new rule to generally allow a radiofrequency device with an integrated electronic display to electronically display any labels required by the rules. This will include the FCC ID required for certification as well as any warning statements or other information that the rules require to be placed on a physical label on the device. The rule will also require that this electronic labeling information is secured in order to prevent modification by a third party. The rule will require that the user be provided with prominent instructions on how to access the required labeling and regulatory information, in either the packaging material or another easily accessible format, at the time of purchase, and that these instructions be available on the product-related website, if one exists. When devices are imported, the Notice proposes that devices displaying labeling and regulatory information electronically must also place this information either on the product packaging or on a physical label placed on the device at the time of importation, marketing, and sales. If a physical label is used, it may be a removable label, or, for devices in protective packaging, a label on the protective packaging. These alternatives may be useful when placing the information on the product

packaging is not feasible, such as when devices are not individually packaged. The proposed rules would not change the requirement to place warning statements or other information on device packaging or in user manuals, or to make information available at the point of sale. The Notice is not proposing to require parties to display any information that is not already required by the rules as part of an electronic label, nor is it proposing to eliminate the ability of manufacturers to continue to physically label devices if they wish to do so.

9. ARRL does not oppose the proposed rule with respect to electronic display of labels, nor any of the proposed provisions. However, there is an urgent need for the addition of certain labeling requirements for certain Part 15 and Part 18 devices. Necessitating change, notably, is the fact that there are many industrial Part 18 devices sold that are neither intended nor designed for use in residential environments, but because there is no external labeling of the packaging of those devices, the end user consumer is left without guidance. Typically in these cases, the retailer of the equipment provides none.⁵ Therefore, unless a retail buyer opens the box of a device and reads the manual (which few purchasers of, for example, RF lighting devices ever do)

⁵ On July 14, 2015 for example, ARRL submitted to the Office of Engineering and Technology and to the Enforcement Bureau a complaint about marketing practices of Home Depot. In that complaint, ARRL referenced studies conducted in several states, and discovered an alarming number of instances of retail sale of electronic lighting ballasts, in which non-consumer-rated ballasts were mixed in with consumer ballasts and other consumer products. Furthermore, the display signage in many cases did not mention or adequately address FCC Part 18 requirements as they pertain to interference in a residential environment. In most of the stores surveyed, unsuspecting consumers have no way of knowing the significance of consumer vs. non-consumer ballasts. In some cases, “commercial” grade ballasts, with their associated non-consumer emissions limits, were marketed as a heavier duty or superior product. The display signage typically used implied that commercial ballasts are a product upgrade for home use. ARRL’s investigations reveal similar practices by Lowe’s and WalMart. The retail marketing arrangement typically does not include or mention the applicable FCC requirements: See §§18.305(c) and 18.307(c). There are two classes of Conducted and Radiated Emissions limits for RF lighting devices such as CFLs and Electronic Fluorescent Light Ballasts. One is for consumer equipment (defined at Section 18.107 as that category of ISM equipment which is used or intended to be used by the general public in a residential environment, notwithstanding its use in other areas). The other is for non-consumer equipment (which of necessity is intended for non-residential applications). These classes of limits are vastly different. For example, the conducted emission limits for these devices operating in Amateur Radio allocations below 30 megahertz are 22 dB different as between consumer and non-consumer applications.

he or she will not get the message at all. The result is the routine deployment of industrial RF devices in residential areas. This proceeding is an appropriate opportunity to address these concerns. For RF devices operating under Part 15 or Part 18 which might be deployed in residential areas or sold to consumers at retail, labeling on the exterior of a package is critical in terms of protecting both the consumers of the devices and those who utilize receivers in residential areas, such as Amateur Radio licensees and AM Broadcast station listeners.

10. Most urgent is to address this problem relative to Part 18 ISM devices. The Part 18 rules should be amended as follows: (1) A definition should be created in Section 18.107 for the term “consumer RF lighting device” so as to provide a means to differentiate consumer devices from those intended for use in industrial or commercial environments;⁶ (2) Part 18 RF lighting devices should be categorized and defined as consumer (i.e. Class B, using the part 15 nomenclature for digital devices) and non-consumer (i.e. Class A)^{7, 8} This is already being done

⁶ Some possible text for this new definition is as follows:

§18.107 Definitions.

(g) *Consumer ISM equipment.* A category of ISM equipment used or intended to be used by the general public in a residential environment, notwithstanding use in other areas. Examples are domestic microwave ovens, jewelry cleaners for home use, ultrasonic humidifiers and certain RF lighting devices that ionize gas as part of their intended function.

⁷ Some possible text for these new definitions is as follows:

§18.107 Definitions

(k) *Class A RF lighting device.* A non-consumer rated lighting device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.

(l) *Class B RF lighting device.* A consumer rated lighting device that is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Examples of such devices include, but are not limited to, electronic fluorescent light ballasts and CFLs utilizing RF circuitry.

Note: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as a Class B device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use.

⁸ Fluorescent lights with electronic ballasts, electronic ballasts and CFLs typically operate under Part 18. Part 18 has a separate set of absolute limits for “RF Lighting Devices.” These limits are then broken down into consumer and non-consumer devices. The limits are higher for non-consumer devices, similar to Part 15A and 15B for digital

by some manufacturers but there is no specific definition or provision for such in the rules.

(3) Among the labeling requirements in the Rules governing labeling of Part 18 devices should be added the following or similar:

“In addition, all Class A RF lighting devices and fixtures must bear the following advisory statement in a conspicuous location and clearly visible on the device or fixture. This statement must also be included on the device packaging or box such that it is conspicuous and clearly visible at the time of sale or purchase to an end user:

‘CAUTION: This is an FCC Part 18 Class A device and may cause harmful interference to radio communications. It should not be used in a home or residential environment. Any interference to authorized radio services caused by this device in a residential environment must be corrected by the user at his or her expense.’”

Information with respect to Part 18 ISM equipment should be provided to the user in the instruction manual or on the packaging of the device if an instruction manual is not provided, on the following subjects:

- (a) The interference potential of the device or system.
- (b) Maintenance of the system.
- (c) Simple measures that can be taken by the user to correct interference.
- (d) Manufacturers of RF lighting devices must provide an advisory statement, either on the product packaging or with other user documentation, similar to the following:

This product may cause interference to radio equipment and should not be installed near maritime safety communications equipment or other critical navigation or communication equipment operating between 0.45–30 MHz.

devices. (There is, however, no distinction in Part 18 nomenclature with respect to these consumer and non-consumer devices and therefore no distinction made in the marketing of the devices or the labeling of them). Quasi-Peak Part 18 limits from 3 to 30 MHz for consumer and non-consumer RF lighting devices are 48 dB_{μV} and 70 dB_{μV}, respectively. For consumer devices, these are the lowest of any specified limits in Parts 15 and 18 of the rules. It is also notable that, in the case of Part 18 lighting devices, the Commission has created a special set of lower limits just for them. Apparently, the difficulty in eliminating interference from a widespread proliferation of Part 18 bulbs in homes and neighborhoods is something that was a concern when the rules were written. Unlike fluorescent bulbs however, LED bulbs operate under Part 15. The limits for these bulbs are 56 dB_{μV} from 0.5 to 5 MHz, and 60 dB_{μV} from 5 to 30 MHz. LED bulbs are becoming increasingly ubiquitous in many stores and homes. Unlike their Part 18 counterpart however, they have also become a source of interference. The Commission should consider reduction of the Part 15 limits for lighting devices to correspond with the Part 18 lighting device limits between 3 and 30 MHz. This would reduce the RFI potential of LED bulbs before they become an aggregate problem.

Variations of this language are permitted provided all the points of the statement are addressed. The notice may be presented in any legible font or text style.

As the above indicates [including item (d)], the interference potential is not required to appear on the outside of the package. A consumer could easily buy a fluorescent light or ballast and not know there are issues with its intended deployment until the purchaser opens the box after the point of sale. One solution is to require an obvious cautionary instruction on the outside of the package, similar to what appears on the box of a Part 15 unintentional emitter. The suggested wording would be similar to its Part 15 equivalent. In addition, the provision of (c) above should be referenced and the location of this information provided.

11. For Part 15 RF lighting devices, additional labeling requirements are necessary now. First, information for users of Part 15 RF lighting devices intended for use in non-residential environments should be provided, so as to avoid unintended purchase of such devices by consumers for deployment in residential areas. Second, Part 15 labeling requirements for all Class A digital devices and all Part 15 devices intended for use in non-residential environments should be added calling on manufacturers of such devices to include on the box or packaging of any Class A Part 15 device in a conspicuous location and clearly visible at the time of sale or purchase a notice similar to the following:

“CAUTION: This is an FCC Class A device and may cause harmful interference to radio communications. It should not be used in a home or residential environment. Any interference caused by this device must be corrected by the user at his or her expense.”

In this way the manufacturers and retailers of these devices will better be able to prevent deployment of Class A type devices in Class B environments.

V. Modification of RF Devices by Amateur Radio Operators.

12. Paragraph 113 of the Notice states as follows:

In addition, Section 2.1043(e) describes the conditions under which parties may modify equipment approved for use in the Amateur Radio Service [citing 47 C.F.R. § 2.1043(e)]. We propose to retain these provisions (re-lettered as Section 2.1043(h)) because they provide a means for non-manufacturer amateur radio users to modify equipment that had previously been certified or type accepted. We nevertheless seek comment on whether the rule should be amended for clarity or to promote better consistency between our Part 2 equipment authorization provisions and our Part 97 service rules.

The Commission's proposal to retain the "means for non-manufacturer amateur radio users to modify equipment that had previously been certified or type accepted" in Section 2.1043 of the Rules⁹ is critically important to the ability of Amateur Radio operators to fulfill three of the five stated principles that form the basis and purpose of the Amateur Radio Service.¹⁰ There is no doubt but that this rule should be preserved intact. However, it is a question whether the §2.1043(e) rule as currently stated is *sufficient* to permit licensed radio Amateurs to modify non-amateur equipment for use in the Amateur Service.¹¹

13. The Commission asks whether §2.1043(e) should be amended for clarity or to promote better consistency between the Part 2 equipment authorization provisions and the Part 97 service rules. There is a compelling need for clarification of the intent of the rule in the context of this revision. Without such, both Subsection 1.1043(e) and the proposed revised

⁹ Specifically, *see* existing Subsection 2.1043(e), which is proposed in this proceeding to be relettered as Subsection 2.1043(h).

¹⁰ 47 C.F.R. § 97.1 (b, c, d):

The rules and regulations in this part are designed to provide an amateur radio service having a fundamental purpose as expressed in the following principles: . . .

(b) Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.

(c) Encouragement and improvement of the amateur service through rules which provide for advancing skills in both the communication and technical phases of the art.

(d) Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.

¹¹ Reinforcing this concern of radio Amateurs is Paragraph 69 of the instant Notice, pertaining to modification of certified equipment generally. In order to clearly identify the party responsible for compliance with technical rules after a modification of a certified device, the Commission states: "...we believe modifications (of previously certified equipment) by third parties should not be permitted unless the third party receives its own certification." It is not at all clear whether the Commission intends for this recertification obligation is intended to apply to modified *non-Amateur Radio equipment* by licensed radio Amateurs for use exclusively in the Amateur Radio Service, exclusively in Amateur Radio frequency allocations.

Subsection 1.1043(h) can be read to disaccommodate Amateur Radio substantially. Specifically, without clarification, in view of the language of the proposed Section 2.1033(b)(10)¹² and the *proposed* Section 2.1042(e),¹³ both of which seem to apply generally to modifications of previously authorized equipment by any and all third parties, it would not appear as though there is any provision in the rules for the continuation of the ability of licensed radio Amateurs to modify and adapt non-Amateur equipment for use in the Amateur Service. It is critical that Amateur operators be permitted to do this.¹⁴ Thus, the relettered Subsection 1.1043(h) should clarify that radio Amateurs can modify and thus adapt for Amateur use, in Amateur Radio spectrum, equipment that was originally developed for non-Amateur applications *as well as* that which was originally certified or type-accepted for Amateur Radio use.

¹² That Rule would read as follows:

“(10) Applications for certification of U-NII devices in the 5.15-5.35 GHz and the 5.47-5.85 GHz bands must include a high level operational description of the security procedures that control the radio frequency operating parameters and ensure that unauthorized modifications cannot be made.”

It is understood that this proposed rule is not materially different from the existing Section 2.1033(b)(13).

¹³ Proposed Section 2.1042(e) would read as follows:

(e) Manufacturers of any radio including certified modular transmitters which includes a software defined radio must take steps to ensure that only software that has been approved with a particular radio can be loaded into that radio. The software must not allow the installers or end-user to operate the transmitter with operating frequencies, output power, modulation types or other radio frequency parameters outside those that were approved. Manufacturers may use means including, but not limited to the use of a private network that allows only authenticated users to download software, electronic signatures in software or coding in hardware that is decoded by software to verify that new software can be legally loaded into a device to meet these requirements.

It is understood that this proposed rule is similar to the existing rule Section 2.944.

¹⁴ As but one example of this necessity, certain segments of the 2.4 GHz and 5 GHz bands authorized by Part 15 overlap Amateur allocations. In what is perceived to be full compliance with equipment authorization rules in place now, and in compliance with Part 97 regulations, some Amateurs are modifying devices originally designed for Part 15 use for legal use on Amateur bands. The uses of these modified devices are varied, but include fault-tolerant mesh networks for high-speed multimedia communications without the presence of traditional infrastructure or an Internet backbone. One such effort allows users to replace the firmware of off-the-shelf Part 15 Wi-Fi devices, reconfiguring them for Amateur use. Reportedly, this allows self-discovery of routes between nodes and creates a self-healing characteristic of the mesh network. The features necessary for Amateur use of these devices are not typically available in the firmware of normal Part 15 devices. There is presently no vendor of Wi-Fi devices that operate under Part 97 out of the box. The only route available to amateurs presently is to modify Part 15 devices for Part 97 use. This level of experimentation has not, the advocates say, resulted in interference to Part 15 users of the same equipment. If FCC prevents manufacturers from enabling Amateur licensees to modify the firmware of these devices, or alternatively proscribes such modification by Amateur Radio licensees, the use of high-speed multimedia or mesh networks in the Amateur Radio service will be adversely affected. Amateur licensees will be relegated to use of outdated hardware. This in turn will affect the ability to experiment and to adapt and improve existing communications infrastructure.

14. Subsection 1.1043(e) was initially created so as to permit Amateur Radio operators who were not manufacturers or dealers of Amateur Radio equipment to modify linear amplifiers intended for use in the Amateur Service to operate in the 28 MHz band. The rules at the time precluded sale to anyone, including Amateur Radio operators, of linear amplifiers capable of operation between 24 and 35 MHz, as part of an effort to keep those amplifiers out of the hands of Citizen's Radio Service operators and those who would operate illegally in the spectrum immediately below 28.0 MHz. Subsection 1.1043(e) was a means by which licensed radio Amateurs who had been unjustly penalized for the rule violations of non-Amateurs could rectify that penalty by modifying their linear amplifiers themselves to include operation in the 28.0-29.7 MHz Amateur band. The language of the Subsection appears to permit radio Amateurs to modify *only* equipment "*that has been certificated or formerly type accepted for use in the Amateur Radio Service pursuant to the requirements of part 97 of this chapter.*" On its face, therefore, it does not appear to permit amateurs to make modifications of certified or formerly type-accepted *non-Amateur equipment*.¹⁵ However, as a practical matter, licensed Amateur Radio operators have for decades consistently adapted and modified commercial radio service equipment for use in their stations and networks of Amateur stations. As noted hereinabove, this is good for the commercial telecommunications industry and it is good for the Amateur Radio Service. There are very few, if any instances of abuse of this practice by licensed Amateur Radio operators. And regardless of the fairly narrow language of the current Subsection 2.1043(e) of the Rules, the Notice, at Paragraph 113 states the Commission's apparently broad interpretation of that rule section. Paragraph 113 refers to the preservation of the means by which radio amateurs may modify equipment for use in their licensed stations: "We propose to retain these provisions

¹⁵ 47 C.F.R. § 2.1043(e) (2014): "Equipment that has been certificated or formerly type accepted for use in the Amateur Radio Service pursuant to the requirements of part 97 of this chapter may be modified without regard to the conditions specified in paragraph (b) of this section, provided . . . conditions are met"

because they provide a means for non-manufacturer amateur radio users to modify equipment that had previously been certified or type accepted.” It is necessary for the Commission to clarify in a Report and Order in this proceeding, relative to the proposed restatement of the current Subsection 2.1043(e), that it is permissible for licensed radio Amateurs to modify *any previously authorized equipment* for use pursuant to the Part 97 service rules on Amateur Radio allocations by that licensee. Permitting radio Amateurs to make modifications to all previously authorized equipment allows Amateurs to meet the objectives of the Amateur Radio Service by building robust networks—including broadband networks within suitable UHF and SHF Amateur allocations—without the necessity of recourse to or reliance upon commercial networks. Radio Amateurs, in making such modifications do so pursuant to the applicable technical standards for the Amateur Radio Service contained in Part 97 of the Commission’s Rules.¹⁶ These standards are clear, comprehensive, appropriately technically stringent, and have been sufficient to protect other spectrum users at all prior times.¹⁷ The Commission is urged to emphasize that both the construction of personal equipment and the modification of commercially available equipment for use within and conforming to the extensive and thorough equipment standards of the Amateur Radio Service is not only permitted, but encouraged as a desirable objective, given the principles reflected in Section 97.1. At a minimum, the rewrite of the current Subsection 2.1043(e) should read as follows:

¹⁶ This provision is in both the Commission’s existing and proposed rules: “The station licensee shall be responsible for ensuring that modified equipment used at his station will comply with the applicable technical standards in part 97 of this chapter.” 47 C.F.R. § 2.1043(e)(5) (2014); *Notice*, at Appx. A ¶33 § 2.1043(h)(5).

¹⁷ These standards contain provisions governing authorized frequency bands (47 C.F.R. § 97.301), frequency sharing requirements (§ 97.303), authorized emission types (§ 97.305), emission standards (§ 97.307), data emission codes (§97.309), spread spectrum emission types (§ 97.311), transmitter power standards (§ 97.313), certification of external RF power amplifiers (§ 97.315), and standards for certification of such amplifiers (§ 97.317). These sections provide a comprehensive regulatory scheme, about which every current and future Amateur Radio licensee has been or will be examined before earning his or her license.

47 CFR § 2.1043(h):

(h) Equipment that has been certificated or formerly type accepted by the Commission for use in any Radio Service or for use under Part 15 of these Rules may be modified by an Amateur Radio licensee for use in the Amateur Radio Service pursuant to the requirements of part 97 of this Chapter without regard to the conditions specified in paragraph (b) of this Section or otherwise in this Chapter, provided the following conditions are met:

(1) Any person performing such modifications on equipment used under part 97 of this Chapter must possess a valid amateur radio operator license of the class required for the use of the equipment being modified and the frequencies on which the device will operate or utilize.

(2) Modifications made pursuant to this paragraph are limited to equipment used at licensed amateur radio stations.

(3) Modifications specified or performed by equipment manufacturers or suppliers must be in accordance with the requirements set forth in paragraph (b)(1) of this section.

(4) Modifications specified or performed by licensees in the Amateur Radio Service on equipment used other than at a licensed amateur radio station must be in accordance with the requirements set forth in paragraph (b) of this section.

(5) The Amateur station licensee shall be responsible for ensuring that modified equipment used at that station will comply with the applicable technical standards in part 97 of this Chapter.

VI. Conclusions.

15. Given the foregoing, the Commission should not combine the Declaration of Conformity and Verification equipment authorization procedures into a single self-approval program. It should not apply any of the proposed new limitations on Software-Defined Radios to those SDRs intended for use exclusively in the Amateur Radio Service, as has been the policy for the past ten years. The Commission should, however, adopt the new equipment labeling proposals of ARRL with respect to certain Part 15 and Part 18 equipment in order to stop the flood of such devices intended for commercial or industrial areas only into residential areas.

Finally, the Commission should clarify in the proposed Section 2.1043(h) and in the text of any Report and Order in this proceeding that the ability of licensed radio Amateurs to modify and adapt non-Amateur equipment for use in the Amateur Service is beneficial, is permitted and is not restricted by any rule of general applicability adopted in this proceeding.

Therefore, the foregoing considered, ARRL, the national association for Amateur Radio respectfully requests that the Commission revise its equipment authorization rules in accordance with the recommendations contained herein.

Respectfully submitted,

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